TECHNOLOGY FOR

Alaskan Transportation

"Improving Alaska's quality of transportation through technology, training and information exchange."

Spring 1994
Vol. 19 No. 1

IN THIS ISSUE . . .

INSERTS . . .

Calendar of Events

This newsletter is funded by a grant from the Federal Highway Administration and the Alaska Department of Transportation and Public Facilities.

MODIFIED ASPHALT BINDER USED ON HAINES HIGHWAY

by David Sterley, Materials Coordinator/Quality Assurance, Southeast Region DOT&PF

In May of 1993, the Department of Transportation and Public Facilities entered into a contract with the Northern Timber Corporation of Haines, Alaska. Their goal was to reconstruct 2.2 miles of the Haines Highway. The project consisted of minor realignment, widening and reconstruction of the structural section. The structural section improvements included four inches of hot-mixed asphalt-treated base, capped with two inches of hot asphalt pavement.

The Haines Highway experiences relatively cold temperatures when compared to the rest of the southeastern Alaska. As a result, a modified asphalt binder was required in the contract specifications. The modified asphalt binder selected for this project was PBA-3. By specification, PBA-3 had to have a minimum penetration value of 30 at 4° C while maintaining a minimum absolute viscosity of 300 at 60° C. In other words, the asphalt binder was modified in order to perform in the air temperature range of -29° C and 32° C. A simple analogy

(continued on page 4)

Taking Care of Baby

There she is; your million dollar baby, fresh as paint, smooth-skinned, smiling in the sunshine. You wanted it, you got it. Nothing is pleasing in quite the same way as a brand-new highway, and you're a proud parent. "Now," comes the word from a clap of thunder, "take care of it!" A frown wipes the smile from your face, and you start to work: taking care of baby.

Taking care of this baby is a multi-billion dollar business that uses the skills of everyone from grader operators to research scientists to elected officials. The nation presently spends $10-12 billion per year on hot-mix asphalt alone, and estimates are that we should spend $1.7 trillion dollars on highways over the next ten years. **Theory says a highway pavement should have a design life of 20 years. Theory also says you should spend fifty cents per square yard of pavement to maintain it properly.**

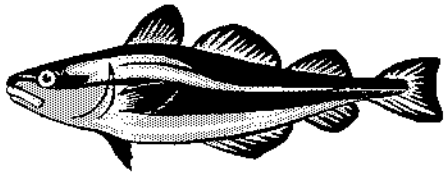
The public tells you how good a job you're doing. Technicians talk about a highway's "serviceability index," but this is no more than a quantitative measure of what the public knows and cares about. Does pavement give them a rough ride? How about stoppability? What about vehicle damage? And safety? And can they use it whenever they want to — and if not, why not?

In short, a highway is not just for driving on. It is an economic entity, a job-generator, a tax-eater, and a political hot potato. A community's investment in its highways is a huge undertaking that needs constant thought. Pavement is worth every bit of management attention it gets.

(continued on page 3)

Culvert Design for Alaska's Stream Crossings

The Alaska DOT&PF design engineers are now using culvert design methods which recognize the passage of weak swimming fish. The design methods are a product of several years of joint effort research by the ADOT&PF, Michael D. Travis, P.E.; University of Alaska Fairbanks, Dr. Doug Kane, Professor and Dr. C.E. Behlke, Professor Emeritus; and the Alaska Department of Fish and Game.



Field work to better define the swimming capabilities and habits of weak swimming fish, in this case, arctic grayling, was conducted near Glennallen and Cantwell on culverts through which large grayling runs pass each spring. Hydraulic conditions in the culverts were also defined. An analytical bio-hydraulic model was developed which first defined net power and energy delivery necessary for fish to perform in differing hydraulic situations. The field work identified conditions at locations within culverts where fish were confronted with hydraulic barriers.

The developed culvert design procedure matches fish power and energy delivery capabilities of fish, with those necessary for delivery if they are to pass successfully through a specific, trial culvert design. If the trial design requires more energy and/or power than the typical design fish is capable of delivering, a design culvert, which the fish is capable of passing through successfully, is sought. Field work data was collected for a report called, "The Fundamentals of Culvert Design for Passage of Weak Swimming Fish," FHWA-AK-RD-90-10. This report sets forth methods and design procedures for retrofitting existing culverts which fish are not presently capable of swimming through. Of course, some streams are either too large or too steep to route through culverts while supporting fish passage. These must be bridged.

Identification of the fish passage design flood for each stream is addressed by the report also.

A new edition of this report has been printed recently that includes updated software to design culverts for most locations in Alaska where passage of weak swimming fish is important. This latest edition also includes a software users manual to expedite the design procedure. These reports are available from The Water Research Center, University of Alaska Fairbanks (907/ 474-7350) and the Alaska T2 Program (907/ 451-5320).

Reprinted with permission by the Water Research Center, from their publication, "Northwater," Number 43, Winter/Spring 1993, edited for Alaska T2 Program.

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Transportation Forum

The Tenth Annual Alaska Transportation Forum is scheduled for May 20, 1994, in Anchorage, at the Hotel Captain Cook. If you would like more information, contact Conferences and Special Events at (907) 474-7800.

Eisenhower Faculty Fellowships

The Alaska T2 Program has received the 1994 Faculty Fellowship Announcements for the Dwight David Eisenhower Transportation Fellowship Program. Six awards are available. The objective of the Program is to enhance the careers of transportation professionals, and to retrain top talents in the transportation community of the United States. The Program is intended to help upgrade the total transportation community in the United States and encompasses all areas of transportation.

If you would like to receive a copy of the application, or have questions, please contact the T2 Program office at (907) 451-5320 or contact:

Ms. Ilene D. Payne, Director
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Would you like to publicize an upcoming event in our newsletter? Comments on articles or you have an article you would like published? If yes, contact our office at (907) 451-5320. We would like to hear from you!

Alaska T2 Road/Air Program

Make your reservations for the T2 Program to visit your organization in 1994.

T2 offers free video-based instruction and information which is presented at your shop, maintenance yard, or training facility. We provide all instructional materials; we may ask that you provide a TV and VCR. Modules vary from two to approximately four hours in length.

These workshops are scheduled on a first-come, first-served basis. The host agency or organization is responsible for making arrangements for a meeting place and providing breaks as appropriate. We strongly

encourage each host to invite neighboring agencies, organizations, and communities as space permits.

Call us at 451-5320. Customized video-based modules can be developed to meet your needs.

Taking Care of Baby
(continued from page 1)

The Role of Maintenance

Between a highway's construction and its reconstruction, your main ally is pavement maintenance.

Pavement demands constant attention. A good highway supervisor worries about every risk his pavement faces, knows every ailment it may develop, watches its aging week-by-week, and makes choice after choice for its well-being.

First is the evaluation, (including testing and surveys). Second comes pavement maintenance, which may be long-term or short-term. Maintenance, when extensive, becomes the third costliest choice: rehabilitation. Here too there are alternatives. All of this is to fend off a need for reconstruction.

The Risks to Pavement

The risks to pavement stem from weather, especially from standing and flowing water, and from traffic, in terms of volume and type.

The risks may seem to be beyond any supervisor's control, but they're not altogether. A supervisor may, for instance: close a deteriorating road to truck traffic; may emphasize preventive culvert maintenance to avoid water damage; and may use salt or a non-corrosive substance for ice control. He may freak out every time he sees standing water. Etc., etc.

Sooner or later, however, the signs of aging will appear in the million-dollar baby: alligator cracking, ruts, shear failures, longitudinal cracks, frost heaves, spring breakup, bleeding, potholes, and more.

The Response to Aging

The supervisor can make any of a number of choices:

- crack sealing and pothole filling,
- surface patching,
- hill and fill (with or without overlay),
- heater-scarification and overlay,
- disk and relay (with or without heating),
- remove and replace patching,
- thin overlay and local dig-outs or leveling,
- intermediate overlay and local dig-outs,
- thick overlay, or overlays with interlayers,
- in-place recycling, or
- sealing (chip, slurry, cape, fog, rejuvenator).

Which response the supervisor chooses, and when, has heavy consequences for the budget in the present and future years. Short-term and long-term responses need to be planned.

The Need for Surveys

Accurate, comparable information on each road section is the basis for all pavement maintenance planning. A supervisor needs information about three basic matters: ride quality, pavement distress, and safety (enough friction for stopping).

The information comes from non-destructive testing, observation, and prior records. Various indexes or data summaries are generated, which enable you to compare one pavement section to another. For example, ride quality may be measured by a Serviceability Index, Roughness Measurement, Profile Measurement, etc. Safety can be indexed according to skid resistance and proper draining, etc.

All of this information should eventually be computerized in a data base. (Proprietary programs exist. Various communities have adapted them into new models.)

The Need for Management

The buzz-words for the necessary planning are Pavement Management System (PMS). They're more down-to-earth than they sound.

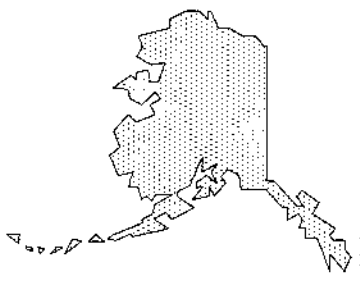
Essentially, any PMS is a way of organizing your maintenance: taking what you already know, filling in the gaps systematically, analyzing the information, and choosing the right response. All PMSs pay close attention to budget realities; in fact, they are cost-saving devices. Every PMS fits short-term responses with a long-term approach to taking care of baby. A PMS is a way of thinking, done with the help of quantitative measures provided by your data base.

Only by using quantitative measures can reasonable and justifiable choices as to maintenance be made. If the budget keepers and the people on the job can all approach the job in an organized, long-term manner, then your million-dollar baby will grow up to be a healthy 21.

Adapted from Spring 1993 issue of the Nevada T2 "Milepost," Vol. 2, No. 4.

NEWS RELEASE

ADVANCE NOTICE: TWELFTH NATIONAL TRAILS SYMPOSIUM - will be conducted in Anchorage September 26 through October 1, 1994. A pre-symposium workshop is being developed that will primarily focus on Borough and State Transportation and Enhancement Activities within the Surface Transportation Program and the State Scenic Highway Program.



The Workshop will be presented in a moderator-panel format. Meetings will be conducted at the Egan Convention Center and are tentatively scheduled for Monday and Tuesday, September 26th and 27th. Other transportation related sessions are scheduled for the following days during the National Trail Symposium.

It is anticipated that Municipal, State DOT/PF, FHWA, and other federal agency personnel will present a variety of projects. Model projects, as well as not so successful efforts, will be examined to identify the necessary elements required for a successful project. The public input, planning, design, and construction phases of project development will be analyzed. Information concerning Federal program requirements and recent spending levels will be provided. Future program directives will also be highlighted.

Project case studies are being solicited to support this workshop. All transportation personnel are encouraged to recommend additional topics and projects. Let's hear about your experiences in developing transportation enhancements via the ISTEA program. To offer technical assistance and/or to discuss session details, contact the workshop Coordinator: Chuck Kaucic, Project Manager, Matanuska-Susitna Borough Public Works, 350 East Dahlia Avenue, Palmer, Alaska 99645, 745-9807.

Modified Asphalt Binder
(continued from page 1)

for modified asphalt binders is that of a multi-viscosity motor oil: enhanced performance over a comparatively wide range of temperatures.

In the end, however, the asphalt binder specifications did not specify how the binder was to be modified, what type of polymer to use, or how much polymer to add. As such, the contractor was free to propose any method and recipe which would meet the PBA-3 specification. The contractor proposed using a 150-200 penetration graded asphalt supplied by Husky Oil of Alberta, Canada, modified with 2 1/2 percent styrene butadiene rubber (SBR), a liquid latex, supplied by Ultrapave Western of Dalton, Georgia. The contractor's polymer supplier (Ultrapave Western) was responsible for shipping the SBR from Georgia to Alaska, storing the SBR at the construction site, calibrating the necessary pumps and providing a metering system insuring that the on-site injection system resulted in an acceptable modified binder.

It should be noted that the mixture was designed by the Marshall Method, a series of steps used to design asphalt. The addition of 2 1/2 percent SBR in the binder had no noticeable impact on stability, voids, unit weight or flow. In terms of binder modifications, 2 1/2 percent polymer is considered a relatively small amount that has little impact on the Marshall criteria. However, the Marshall design method is limited in terms of analyzing the temperature characteristics of the asphalt binder. Hence, the Strategic Highway Research Program (SHRP) has developed specifications based on the desired performance level at any given ambient air temperature and designed testing equipment which more accurately models that performance.

As in the case with any pertinent specification or construction technique, the success of the product is dependent on its long-term performance in the future. Therefore, the DOT&PF has contracted with Applied Paving Technology of Houston, Texas, in order to evaluate the modified mixture's in-place temperature characteristics and determine its potential long-term performance. This testing program is based on SHRP developed testing equipment and will result in data that will effectively predict anticipated performance.

In summary, the asphalt industry is moving rapidly toward performance based specifications relative to asphalt binders and mixtures. The PBA binder specifications used on the Haines Highway and throughout southeast Alaska are based on anticipated performance within a specified temperature range, and tested by conventional visco-elastic methods. These specifications are intended to be transitional until SHRP specifications and equipment have been fully developed, implemented and adopted by the using agency.

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Soil Identification in the Field

When laboratory facilities are not available, simple field tests offer a quick way to identify soil types. These tests are used to determine gradation, presence or absence of plasticity and some properties of frozen soils.

Gradation Tests

To test the gradation of dry soil, spread a sample of the material on a flat surface. Use a piece of stiff cardboard as a rake to sort the larger soil particles to one side (Figure 1).

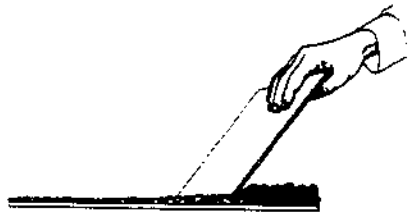

Figure 1: Gradation Test

Estimate the percentage of particles larger than 6 mm (1/4 inch) and the percentage of fines (those that are too small for the individual grains to be seen by the unaided eye). Estimate whether the larger particles are uniform in size (poorly graded) or are a mixture of large, medium and small sizes (well graded).

If the soil is wet, break a lump apart with a pencil and make percentage estimates as in the dry soil method. To find the percentage of fines, put 3 mm (1/8 inch) of water in a clear glass and then add enough soil to fill the glass one-quarter full. Add water until the soil is just covered. Mark this level with a rubber band. Fill the jar three-quarters full with water and stir the mixture vigorously. Let settle about one and one half minutes and mark the height of the soil that has settled out (Figure 2).

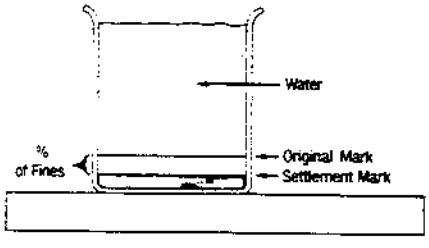

Figure 2: Settlement Test #1

The difference between the two marks represents the approximate percentage of fines.

In addition to the quick test just described, a slightly more detailed gradation test can be used to determine rough percentages of soil grain sizes, as well as to approximate how difficult it may be to compact the soil. All that is needed is a clear glass, water, and a representative soil sample.

Fill the glass one-quarter to one-third full with the material. Then fill the container with water to within 13 mm (1/2 inch) of the top. Stir the mixture well and observe how the material settles out (Figure 3).

The material will settle in three distinct layers—sand at the bottom, silt next, and finally clay. Besides showing the various groups, the results will show whether the soil is well or poorly graded. Although the silt and clay particles are smaller than the eye can see, gradation changes can be observed by color or textural differences. Also, the longer it takes a layer to settle, the smaller the particles.

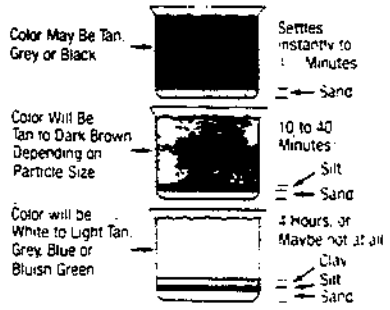

Figure 3: Settlement Test #2

There are several things that can be learned from this test. It will show the basic materials and gradation of each, and the settling time will indicate the fineness of the particles. In most cases, a single particle size (poor gradation) and a small particle size will mean more difficult compaction than in a mix where there is a good gradation of all particle sizes.

Tests for Plasticity

Shaking Test: Pick up a lump of fine-grained soil and knead it together, working out as many large-grained particles as possible. Add water gradually and knead the soil until it begins to get sticky. Hold the ball of soil in the palm of one hand and tap the back of that hand with the fingers of the other hand (Figure 4).

Figure 4: Shaking Test

If the ball gets shiny and wet on the surface, it is mostly fine sand or silt. Clays have little or no reaction to this test and simply get messy.

Plasticity Test: Take about half the ball of soil and knead it between the thumb and forefinger to dry it out. Then, attempt to roll the soil sample into a 3 mm (1/8 inch) thread or "worm" (Figure 5).

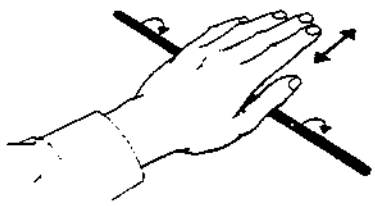

Figure 5: Plasticity Test

If a worm cannot be formed at all, the soil is probably a silt or fine sand. Highly plastic soil takes a long time to dry out. It gets hard and waxy and considerable pressure may be required to form a worm that may break at the 3 mm (1/8 inch) diameter. Some clays will form a thread smaller than 3 mm.

Dry Strength Test: Take the other half of the ball of soil and knead it into a ball. Set it aside to air dry. When the soil is dry, crush it and select a jagged, pointy fragment. Try to crush this fragment between the thumb and forefinger. A silt will turn to powder with little effort. A clay will be like a rock and almost impossible to crush with the fingers.

Hand Washing: After handling silts and sands, the fingers will feel dusty, and rubbing the fingers together will almost clean them. Water flowing gently from a faucet will rinse off the soil. When clays are handled, a crust will form on the fingers that cannot be rubbed off when dry. Water will not rinse the clay off. Hands must be rubbed together under water to cleanse them.

Frozen soils

These tests apply mainly to soils with a particle size of 6 mm (1/4 inch) and smaller:

Determine Frozen Versus Unfrozen Condition: Take a fist-sized lump of soil and knead it between the fingers. Frozen soils may initially feel totally solid or contain frozen pieces which will gradually soften when heated in the hand. Frozen soils with a high moisture content will release a noticeable amount of water upon thawing in the hand or other warm container. This test must be quickly done on soil taken directly from the sampled location. Unfrozen soil will freeze or a frozen soil will thaw quickly depending on exposure to various air temperatures. It may be extremely difficult to determine whether very dry soils are frozen or not.

Estimate Thaw-Consolidation Potential of Frozen Soil: Place enough frozen soil in a glass container to fill the container about two-thirds full. Allow the soil to thaw. After thawing is complete, check to see if a significant amount of water has been released from the soil—if so, gently shake and/or tap the container to cause the top of the soil layer to become level. Allow an additional 15 minutes for settlement. Measure the thickness of any water layer on top of the soil. Divide the water layer thickness by the total thickness of all material in the container (water plus soil). The results indicate the minimum, fractional volume loss that can be expected if the material thaws in-place. For example, a value of 0.2 would mean a minimum 0.2 meter loss of thickness, i.e., thaw-consolidation, for each additional meter of thaw depth.

The potential for thaw-consolidation is usually a paramount design consideration. During thawing, the volume of the soil will reduce from zero percent to

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almost 100 percent, depending on the initial (frozen) moisture content. Frozen soils that show any water on top of the soil as a result of this test may settle enough to cause serious problems in almost any design.

Soil Clues Summary

Various soil types have distinct reactions to the field tests.

Clays: No reaction to the shaking test; a tough worm that dries out slowly; a crusty dry residue that is hard to remove from the hands.

Silts: Rapid reaction to shaking test; weak or crumbly worm; powdery residue that is easily wiped or washed off the hands.

Silt or Clay Mixtures: Intermediate or conflicting reactions to hand tests.

Silt or Gravel with a Few Clay Fines: Enough clay to soil the hand if a wet sample is kneaded, but not enough to allow a lump of clay to be formed.

Sand or Gravel with Silt Fines: Any mixture with dusty or fairly gritty fines.

Clean Sands and Gravels: Water added to these soils sinks in immediately without making any mud.

Frozen Soils: Chunks of frozen soil will soften and are likely to release free water when warmed in the hand.

Caution! Results of these tests are tentative, and soil classification for engineering design purposes should finally rely on laboratory test results. Samples must be selected so as to be truly representative of the overall soil mass. Generally, increasing the number of samples helps improve the quality of the test data.

Original article adapted from "The Bridge," winter 1992, by "Caminos," second quarter 1993. The "Caminos" article was adapted for Alaska by Bob McHattie, geotechnical engineer for ADOT&PF Northern Region.

Soil Test Checklist

Watch for these possible reactions when you are using in-field do-it-yourself soil tests:

- No reaction to the shaking test, a tough worm that dries slowly, and a crusty residue that is hard to remove from your hands indicates the soil is clay.
- Rapid reaction to the shaking test, a weak or crumbly worm, and powdery residue that washes easily from your hands indicates silt.
- Intermediate or conflicting reaction to hand tests indicates mixtures of silt and clay.
- Enough clay to soil your hands when you knead a sample, but not enough to form a lump indicates sand or gravel with silt fines.
- Dusty or gritty fines indicate sand or gravel with silt fines.
- When added water absorbs immediately into the soil without making mud, you probably have clean sands and gravels.

Reshaping Aggregate Roads

Reshaping involves more than just smoothing the surface. After a period of rainfall or slow-melting snow, traffic scatters the aggregate, flattens the crown, makes potholes and deep ruts in the road, and produces a rough, washboard surface. These conditions cannot be corrected by smoothing the surface; the aggregate base must be reshaped.

Reshaping involves remixing the aggregate base to get a proper blend of fines and different size aggregates, then blading this blended material into a properly crowned surface. When remixing, you may need to add additional aggregates or fines to the road surface and shoulders, particularly in rough spots or washed-out areas.

The art of proper blending is a cut-and-dried proposition, depending on the types of materials at hand. Experience will provide know-how to determine the correct blend.

The crust that forms what is left of the old wearing surface is broken up during remixing, often with a scarifier. After the aggregate base is remixed, it is bladed to obtain a smooth surface with the proper crown. A new set of cutting edges gives the best result. As with smoothing, reshaping should be done when the aggregate is moist.

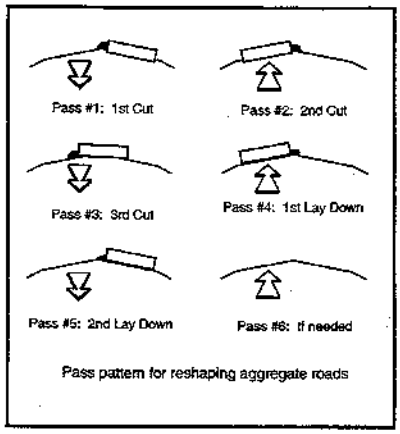
1. Place the traffic control devices where appropriate. Use a flagger if circumstances require.

2. Check the moisture content of the road surface. A damp surface will prevent the loss of fine particles such as dust and provide proper compaction. Use a water truck to dampen the surface in dry weather.

3. Check to see if more aggregate or fines need to be added to the surface and shoulders, particularly in rough spots or washed-out places.

Tilt moldboard back to cut into ridges and potholes

4. Tilt the moldboard to a cutting position, if needed, for hard materials. This will let the blade cut into ridges and potholes. In all other conditions, the moldboard should be straight up to get the rolling and mixing action in front of the blade.



Pass pattern for reshaping aggregate roads

5. Angle the moldboard at 30° to 45°. When cutting from the shoulder toward the center of the road, you should have enough moldboard angle to make sure the fines go back into the middle of the road rather than spilling off into the ditch.

6. Using a mixing action, move and roll the aggregate toward the center of the road.

7. Lean the front wheels 10° or 15° from the vertical into the direction the aggregate is rolling across the blade.

8. Put enough pressure on the blade to cut shoulders and washboard ridges.

9. Scarifying, when necessary, should go as deep as the average pothole or washboard – usually two or three inches.

10. Watch blade action very closely and continuously adjust the controls to get good cutting and mixing action.

11. Check to see if more passes are needed in the same direction to continue mixing, cutting to the bottom of potholes and ridges, and to windrow aggregate to the center of the road.

12. Windrow remixed aggregate to the center of the road.

13. Distribute aggregate evenly over roadway edges and shoulders, blading the material into a proper crown.

14. When you're all done, the slope of the shoulder should not exceed the slope of the road.

From Michigan Technological University's "The Bridge," Vol. 7, No. 3, Spring 1993, adapted for Alaska T2

Soil Bioengineering

Erosion Prevention Technique Applicable to Low Volume Roads

Leonard M. Darby. Transportation Research Record No. 1291, Vol. 2, from Fifth International Conference on Low Volume Roads 1991, 10 pages.

Bioengineering, while sounding complicated, has produced some practical solutions to problems of unstable ground, drainage, erosion control, etc.. This multi-faceted work displays a successful procedure for stream erosion protection, which gets better with time, while many riprap installations degrade with time.

One of the systems involves cutting live willow brush a half-inch to one-and one-half inches in diameter into two-foot lengths and wiring a number of trunks and branches together tightly into a bundle (sharpened to drive).

These are pressed into an area needing deep roots and live surface vegetation. These are called Live Fascine Bundles (live stakes) and will root in place with a constant source of water.

This homespun solution could be handled by road authority forces during non-peak periods.

From Minnesota Department of Transportation's "Research Publications Review," Number 1, August 1993.

For More Information

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Multi-Media

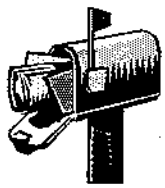
by Billy Connor

"Send the FY95 Budget Spreadsheet to Tom, Cindy and John. Schedule a one hour teleconference for tomorrow at 2:30. Get the Aurora Creek erosion photos." I'm not talking to my secretary. I'm talking to my computer.

Perhaps you think I've been watching too much Star Trek. However, science fiction has an uncanny way of predicting the future. There are computer systems available today which can do what I described and much more. Let's look at how it can be done.

First, the computer must understand voice instruction. There are several packages on the market which can do this. Compaq, you may remember, advertises voice recognition as a feature of its system. Vocabularies exceeding 4000 commands are common for today's computers.

In the example above, the computer must associate Tom, Cindy and John with the FY95 budget. That's no more than a data base. No big problem here.

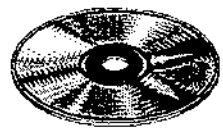


Electronic Mail and scheduling allow for establishing meeting times. The computer checks the electronic scheduling data base to ensure all the people involved are available. It then schedules the meeting and notifies the participants through E-mail. Systems are available to do this.

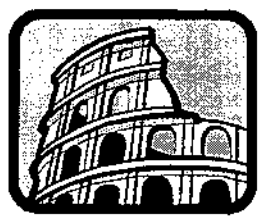
I also asked the computer to display photos. It is fairly easy to scan photos into the computer and send them through a network to all those who need them. The photos can be annotated with voice or text to enhance the viewer's understanding.

All of this technology falls under the term Multi-Media. Multi-Media allows us to use the computer to display information through all available media including, text, graphics, video, and audio. Through Multi-Media, computers begin to interact with the human by responding to the human voice and the more traditional keyboard. The computer can also respond to our inquiries for information in a format you choose.

I find it interesting that home computing may be taking greater advantage of the computer than the business world. I recently purchased a CD player for my computer at home. The cost was $299, which included four CD's. I'm amazed at what is available. As I watched the videos of animals and heard the sounds while a narrator described the habits of the animal, I thought of the many business, scientific and engineering applications.



I bought a copy of Microsoft's Encarta. My son was doing a school paper on the Roman Empire so I asked the computer to do the research. It found over 1000 discussions of the Roman Empire. Many of these entries have photos, video and narration. As we explored each topic, we found we could home in on almost any detail we wanted. Both my son and I learned more in a couple of hours than we could have in a week at the library. And believe me, it was a lot more fun.



Consider problem solving through on-line services. For example, I have a problem with the quality of the pavement on a construction project. I could use something like Encarta to solve my problem or to investigate new ideas. If a CD contains all the current information on paving construction, then I could use an interactive query system to seek out a solution or several possible solutions. Like many CD's available, the information would be presented via photos, video, animation and narration. At least I wouldn't fall asleep reading a bunch of boring, repetitive research reports.

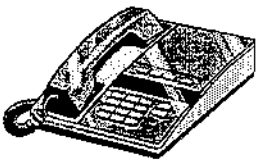
Interactive games abound. Games probably represent a major advancement in computing. Based upon the response of the player, the computer selects the

appropriate reaction using sight and sound. Each gaming session then becomes unique. The player learns cause and effect relationships without the tedium of manuals. Imagine applying this technology to training or the testing of ideas!

For example, we could easily train supervisors to handle problem employees through a game. The employee could be given a personality which would react to the supervisor's actions. Perhaps the supervisor could select the personality of an actual employee to test an idea before confronting the employee.

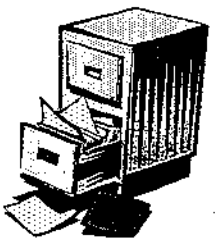
The technology discussed thus far is readily available. All we need to do is use it. But what does the future hold?

First, expect the computer to become your communications center. Within the next few years, your phone will become an integral part of your computer system. The computer will have direct access to the switchboard. This will allow routing of calls, notifying the user of not only who's calling, but also any information regarding the caller. For example, if Charlie calls and you have been working with him on a position paper, the computer could automatically pull up the appropriate file. Anyone who has seen my desk would appreciate how helpful that would be.



Video conferencing will soon be done through your computer. The need for conference rooms would be reduced. Not only will you be able to see the other people's faces, but you will share information using multimedia. Or, perhaps you will attend and participate in a conference thousands of miles away. There goes the nightlife away from home. Surprisingly, the cost of all this will be far less than the cost of video conferencing of today.

Computers are also becoming our filing systems. I'm sure that you have heard about computers creating the paperless society. So far, the opposite has been true. I can now create meaningless paperwork at an alarming rate. However, that is beginning to change. I keep all my correspondence and information on disk in addition to the paper files. If I need a file, I look to the computer first. It's much faster. I can even find it.



Paperless filing systems are now on the market which will catalog and store any kind of document you wish. You can annotate the documents with either written comments or voice comments. But what about the cost of disk space? If you use CD technology, you can store 400,000 pages for less than $100. That is far less than the cost of the filing cabinets we now use. The cost of the floor space saved is far greater. Further, the cost of retrieving a file, especially an old one, is grossly reduced.

At this point, you may think I've let my imagination get the best of me. If, however, you take the time to think about it, all the pieces necessary for full-blown Multi-Media are on the shelf today. It is simply a matter of putting them together. The only thing holding us back is ourselves. To some, this rapid development in technology is exciting. To others, it's frightening.

Personally, I can't wait.

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Place a check by the videos you wish to borrow.

____ **Here's How Roads Are Built**, ID-261, Video University Productions, 1993, 15 min. For children ages 4 and up.

____ **Idea Store - Volume 8**, ID-259, Pennsylvania Department of Transportation, August 1993, 10 min.

____ **Maintaining Asphalt Roads/Blade Patching**, ID-262, New Mexico Department of Transportation, January 25, 1993, 11:45 min.

____ **Response to Winter**, ID-260, Pennsylvania Department of Transportation, September 1993, 20:40 min.

ADDITIONAL PUBLICATIONS AVAILABLE FOR LOAN

Place a check by the publications you wish to borrow.

____ **1992 FRHRC Achievement Report**, ID-1192, FHWA-RD-93-172, U.S. Department of Transportation, Federal Highway Administration, Turner-Fairbank Highway Research Center, 1994.

____ **Appraisal and Appraisal Review for Federal-Aid Highway Programs**, ID-1178, FHWA-HI-93-051, Participant Notebook from NHI Course #14126, revised September 1993.

____ **Bibliographies for Physical Properties of Asphalt Cement**, ID-1175, SHRP-A-626, Strategic Highway Research Program, National Research Council, September 1993.

____ **Bridge Management for Transportation Agencies**, ID-1191, Transportation Research Board, National Research Council, Texas Department of Transportation, U.S. Department of Transportation, Federal Highway Administration, 7th Conference on Bridge Management, September 15-17, 1993.

____ **Control Criteria and Materials Performance Studies for Cathodic Protection of Reinforced Concrete** , ID-1174, SHRP-S-670, Strategic Highway Research Program, National Research Council, October 1993.

____ **Demonstration Project No. 76, Automated Traffic/Truck Weight Monitoring Equipment (Weigh-In-Motion)** , ID-1183, FHWA:DTFH71-89-76-AR-26, Arkansas State Highway & Transportation Department, U.S. Department of Transportation, Federal Highway Administration, March 1992.

____ **Design, Construction, and Quality Control Guidelines for Stress Laminated Timber Bridge Decks**, ID-1185, FHWA-RD-91-120, U.S. Department of Transportation, Federal Highway Administration, September 1993.

____ **Development of Ground-Penetrating Radar Equipment for Detecting Pavement Condition for Preventive Maintenance**, ID-1173, SHRP-H-672, Strategic Highway Research Program, National Research Council, October 1993.

____ **Evaluation of Post-Tensioned Concrete Bridge Structures by the Impact-Echo Technique**, ID-1188, FHWA-RD-92-096, U.S. Department of Transportation, Federal Highway Administration, December 1993.

____ **Feasibility of an Automated Truck Warning System**, ID-1186, FHWA-RD-93-039, U.S. Department of Transportation, Federal Highway Administration, September 1993.

____ **HYDRA v2.1 User Manual**, ID-1194, Ohio Department of Transportation, February 22, 1993.

____ **Layer Module Backcalculation Procedure: Software Selection**, ID-1176, SHRP-P-651, Strategic Highway Research Program, National Research Council, October 1993.

____ **Metric (SI) Training for Highway Agencies**, ID-1179, FHWA-HI-93-066, Participant's Workbook, workbook from NHI Course #12301, October 1993. Includes plat diagram.

____ **Metric (SI) Training for Highway Agencies**, ID-1180, FHWA-HI-93-065, Instructor's Guide, guide from NHI Course #12301, October 1993. Includes plat diagram.

____ **Nondestructive and Destructive Testing of a Reinforced Concrete Slab Bridge and Associated Analytical Studies**, ID-1190, FHWA/OH-93/017, UC-CII 92/02, Cincinnati Infrastructure Institute, University of Cincinnati, College of Engineering, December 1992.

____ **Proceedings: Conference on Nondestructive Evaluation of Bridges, August 25-27, 1992**, ID-1195, FHWA-RD-93-040A, DOT-VNTSC-FHWA-93-1, U.S. Department of Transportation, Federal Highway Administration, July 1993.

____ **Project Development and Environmental Documentation**, ID-1181, FHWA-HI-90-030, Student Manual, Notebook from NHI Course #14205, U.S. Department of Transportation, Federal Highway Administration, 1990.

____ **A Review of Transportation Research and Education**, ID-1193, Science and Engineering Research Council, Economic and Social Research Council, Department of Transport, County Surveyors' Society, Rees Jeffreys Road Fund, August 1993.

____ **Side Impact Crash Testing of Roadside Structures**, ID-1187, FHWA-RD-92-079, U.S. Department of Transportation, Federal Highway Administration, May 1993.

____ **Structural Effects of Epoxy Coating Disbondment**, ID-1184, FHWA-RD-93-055, U.S. Department of Transportation, Federal Highway Administration, November 1993.

____ **The Road to 2012: Looking Towards the Next Two Decades**, ID-1196, DOT-T-93-35, U.S. Department of Transportation, United States Coast Guard, March 1993.

____ **The Environmental Guidebook for Motor Vehicle Maintenance and Refueling Operations**, ID-1177, Centennial Edition, Environmental Development Corporation, January 1994.

____ **Transit Planning and Research Reports: Annotated Bibliography**, ID-1189, FTA-TTS-5-93-2, U.S. Department of Transportation, Federal Transit Administration, Office of Technical Assistance and Safety, November 1993.

____ **Wacker Product Manual**, ID-1182, Wacker Corporation Construction Equipment, December 1993.

These videotapes and publications may be borrowed for three weeks. However, if you need the materials longer, contact **Susan Earp** at the Alaska T2 Program at **(907) 451-5320** or TDD: **(907) 451-2363.**

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2301 Peger Road M/S 2550
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FAX: (907) 451-2313

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Organization:_____
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Place a check by the publications you wish to borrow.

____ **1992 Oregon Bicycle Plan**, ID-1163, Oregon Department of Transportation, Technical Services Branch, June 1992.

____ **1992 Driver License Administration Requirements and Fees**, ID-1149, USDOT/FHWA-PL-92-013, May 1992, 52pp.

____ **A Metric American: A Decision Whose Time Has Come - For Real**, ID-1162, NISTIR 4858, U.S. Department of Transportation, Technology Administration, June 1992.

____ **Analysis of Sulfur Compound Types in Asphalt**, ID-1166, SHRP-A-667, Strategic Highway Research Program, National Research Council, September 1993.

____ **Appraisal and Application of Models for Unpaved Roads**, ID-1152, MPC Report NO. 93-22, Mountain-Plains Consortium, August 1993.

____ **Assessment of Border Crossings and Transportation Corridors for North American Trade: Report to Congress**, ID-1156, FHWA-PL-94-009, HPP-22/1-94(5M)P, U.S. Department of Transportation, Federal Highway Administration, ISTEA Section 1089 and Section 6015.

____ **Bikeway Design Manual**, ID-1153, State of Minnesota, Department of Transportation, February 8, 1983.

____ **COM624P - Laterally Loaded Pile Analysis Program for the Microcomputer v. 2.0**, ID-1165, FHWA-SA-91-048, U.S. Department of Transportation, Federal Highway Administration, Office of Engineering, Office of Technology Applications, August 1993.

____ **Communications Handbook for Traffic Control Systems**, ID-1160, FHWA-SA-93-052, U.S. Department of Transportation, Federal Highway Administration, April 1993.

____ **Electrochemical Chloride Removal and Protection of Concrete Bridge Components: Field Trials**, ID-1167, SHRP-S-669, Strategic Highway Research Program, National Research Council, October 1993.

____ **Evaluation of Wetlands Mitigation Measures Volume I: Final Report**, ID-1146, USDOT/FHWA-RD-90-083, May 1992, 365pp.

____ **Fabrication and Testing of Automated Pothole Patching Machine**, ID-1171, SHRP-H-674, Strategic Highway Research Program, National Research Council, October 1993.

____ **Fatal and Injury Accident Rates on Public Roads in the United States**, ID-1144, Highway Safety Performance - 1989, USDOT/FHWA, FHWA-SA-92-003, April 1991, 93pp.

____ **Flagging and Work Zone Traffic Control**, ID-1154, First Class Books, Inc., 1993.

____ **Hazardous Wastes in Highway Rights-of-Way**, ID-1151, National Cooperative Highway Research Program, NCHRP Report 351, Transportation Research Board, National Research Council, 1993.

____ **Highway Statistics 1992: Highway Excellence - 100 Years and Beyond**, ID-1155, U.S. Department of Transportation, Federal Highway Administration, FHWA-PL-93-023, HPM-40/10-93(4.2M)P.

____ **Improved Grouts for Bonded Tendons in Post-Tensioned Bridge Structures**, ID-1145, USDOT/FHWA-RD-91-092, January 1992, 146pp.

____ **Improved Cutting Edges for Ice Removal**, SHRP-H-346, ID-1169, Strategic Highway Research Program, National Research Council, August 1993.

____ **Nationally Coordinated Program of Highway Research, Development, and Technology**, ID-1158, Annual Progress Report, Fiscal Year 1993, FHWA-RD-93-163, HAD-10/11-93(4.5M)QE, U.S. Department of Transportation, Federal Highway Administration, December 1993.

____ **New Cathodic Protection Installations**, ID-1172, SHRP-S-671, Strategic Highway Research Program, National Research Council, October 1993.

____ **Review and Recommendations for Pavement Marking Materials - Final Report**, ID-1164, FHWA-SC-93-04, South Carolina Department of Transportation, U.S. Department of Transportation, Federal Highway Administration, October 1993.

____ **Stormwater Management for Transportation Facilities**, ID-1150, National Cooperative Highway Research Program, Synthesis of Highway Practice, #174, Transportation Research Board, National Research Council, 1993.

____ **Structural Steel Painting Quality Improvement Review**, ID-1159, U.S. Department of Transportation, Federal Highway Administration, Region 10, February 1994.

____ **Summary of Progress: December 31, 1993**, ID-1157, National Cooperative Highway Research Program, Transportation Research Board, National Research Council, 1993.

____ **Synthesis of Current and Projected Concrete Highway Technology**, ID-1168, SHRP-C-345, Strategic Highway Research Program, National Research Council, August 1993.

____ **The Characterization of Asphalt and Asphalt Recyclability**, ID-1170, SHRP-A-675, Strategic Highway Research Program, National Research Council, October 1993.

____ **Toll Facilities in the United States**, ID-1147, USDOT/FHWA-PL-91-009, February 1991, 22pp.

____ **Highway Taxes and Fees: How They Are Collected and Distributed**, ID-1148, USDOT/FHWA-PL-91-017, 1991, 117pp.

____ **Traffic Control Systems Handbook Revised Edition - 1985**, ID-1161, FHWA-IP-85-11, U.S. Department of Transportation, Federal Highway Administration, April 1985.

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METRIC MOMENTUM

by Jerry Murphy, Metric Coordinator, Alaska DOT&PF

KISS DEGREES OF CURVATURE GOOD-BYE

Highway engineers and contractors who have gotten used to describing horizontal curves by their "degree of curvature," will soon be playing a new ball game. Under the metric system, degree of curve will be replaced with radius of curve. Existing curves will have to be expressed to the nearest 0.001 meter, in order to preserve accuracy. New curves, however, can be specified in round numbers, to the nearest 5, 10, or 100 meters, depending on their size.

LONG STATION

Most states have adopted the kilometer as the increment for highway plan stationing, replacing the 100-foot station. Alaska DOT&PF will follow this policy as well. This agrees with the system used in Canada and is the stationing system recommended by AASHTO. As an example, station 12+273.96 indicates a point 273.96 meters forward of kilometer station 12+000. Cross sections and other references along centerline will of course occur at closer intervals, such as 10, 25, or 50 meters.

FUNDING

The FHWA participates at the same funding rate for the development and construction of highway projects in metric as they have in the past for non-metric projects. This includes the conversion of projects already designed in the U.S. Standard measurement, but which must be converted in order to meet the 1996 deadline. (Exceptions to the metric mandate are granted only by the FHWA Regional Administrators.)

Recent FWHA guidance also allows federal funds to be spent for the conversion of highway agency engineering standards such as design manuals, standard plans, specifications and computer software programs. It's about time!

NEW AASHTO PUBLICATION

In December 1993, the AASHTO Highway Subcommittee on Traffic Engineering released an addendum to the "AASHTO Guide to Metric Conversion" called, "Traffic Engineering Metric Conversion Factors." This three page booklet lists nine metric conversion practices relating to traffic engineering, including placement and marking of kilometer posts, delineators, distance signs, clearances, weight limits, and speed limits. The booklet also recommends that the FHWA allow at least two years lead time prior to beginning a six-month nation-wide sign conversion campaign. This of course would have to follow Congressional action funding such a conversion, since the moritorium on highway sign funding is still in effect.

RESOLUTION

On January 13, 1994, the Fairbanks North Star Borough Assembly passed a resolution to adopt the metric system in any department which may receive Federal highway funds. Such implementation would also include metric education of borough employees. Hopefully, other municipalities will follow their example.

AIRPORTS

The Federal Aviation Administration (FAA) already uses metric dimensions in many of its Advisory Circulars regarding airport design and construction. "AC 150/5300-10A, Standards for Specifying Construction of Airports," and "AC 150/5300-13, Airport Design," for instance. In this respect, FAA has been a leader in the metric movement. However, we have seen no published policy or requirements which would tie approval of grants to metrication by airport sponsors. Until such policy is published, we have a verbal agreement with the FAA to follow the same schedule as for Federal-aid highways: September 30, 1996.

THINK METRIC

You will never learn the metric system until you learn to "think" in metric terms. Below are some common items of reference which may help you in this process.

APPROXIMATE COMPARISONS

See table below.

DUAL UNITS

Although dual dimensioning is generally discouraged, personnel involved with right-of-way and environmental activities will show dual (metric/English) units on certain documents. These exceptions to metric policy were deemed necessary because of the legal nature of property descriptions, as well as the sensitive nature of public relations.

CONVERSION CHARTS

The Associated General Contractors of America (AGC) is facilitating the transition to SI by arming its members with metric conversion charts. These charts are available through their offices in Anchorage, Fairbanks, and Soldotna.

TRAINING

Metric training courses are springing up all over the country. The National Highway Institute has developed a metric training course which is geared to public and private sector engineers, technicians, and highway agency personnel. A session was held in Anchorage on March 17, 1994. If you missed it, contact Susan Earp at T2 (451-5320) to borrow course materials.

PROCEDURE

A DOT&PF metric procedure (DPDR 02.01.021) has been drafted and is undergoing statewide review. It provides organization, tasking, and a schedule of conversion deadlines for the Department. It also includes checklists intended for use by each major functional area.

DOT&PF METRIC PRACTICE GUIDE

A metric practice guide is being prepared with an expected issue date of April 1994. Many of the metric standards provided to us from AASHTO and FHWA will be incorporated into the guide, along with helpful tables and information on metric usage.

APPROXIMATE COMPARISONS

Length	Millimeter(mm) Meter(m) Kilometer(km)	Diameter of a paper clip wire A long stride A six minute jog
Weight	Gram(g) Kilogram(kg) MetricTon(t)	A large thumb tack A baseball bat of a small humpy A Honda Civic
Volume	Milliliter(ml) Liter(l) CubicMeter(m^3)	Five to a teaspoon Large soda pop bottle Kodiak brown bear
Area	Meter^2 (m^2) Hectare(ha)	Desktop Football field "squared"
Pressure	Kilopascal(kPa)	Auto tire pressure is about 220
Temperature	DegreeCelsius(C)	Water Boils at 200 Body Temperature is 37 Room Temperature is 22

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Culvert Steamer—The Deicing of Frozen Culverts

By James R. Bassel, P.E., Civil Engineer

Background

During cold weather, culverts can become completely plugged with ice by repeated melting in the streambed and refreezing in the culverts. This cycle of thawing and freezing builds up layered-ice thickness that can eventually plug a culvert. When the weather warms, the ice in a culvert melts at a slower rate than the ice in the streambed. When the culvert is plugged, it acts with the road embankment as a dam until the water rises above the road and washes it out and/or washes out the culvert.

The Superior National Forest (SNF) in Minnesota is faced with this problem many times a year and has found a way to alleviate this problem.

The equipment they use is a liquid propane (LP) steam generating deicing unit (culvert steamer) manufactured by Aeroil Products Co., Inc. This unit is trailer mounted and operated by two field personnel on an as-needed basis.

Equipment modifications

A 15 psi relief valve is supplied, but can be safely replaced with a 25 psi valve to increase working temperature and pressure. The steam nozzle and extensions to speed-up advancement of the nozzle through the culvert can also be improved. The factory equipment requires shutting off the steam and disassembling the steam hose extension pipe to add more length to the nozzle assembly.

To reduce delay time, the SNF has welded the nozzle to the side of a separate advancement pipe and installed quick disconnect couplings on all extension steam pipe sections. Steam does not run through the advancement pipe, as it is only used to push the nozzle through the culvert. The type of quick disconnect couplings installed include snap rings to secure the extension pipe sections from accidental release (which the SNF recommends).

Operation

The 25-gallon capacity of the tank is normally sufficient to thaw one to two culverts. It takes a crew of two about 10 minutes to set up the equipment on-site, and 30 minutes to reach the proper pressure (18-22 psi). If the outside temperature is 20 degrees F or above, and there is no standing water at the culvert outlet, the thaw rate is about six- to eight-feet per minute. If the outside temperature is -10 degrees F or below and/or there is standing water at the culvert outlet, the crew can expect to spend about three hours to clear a 30-foot culvert, including setup and take down time.

The typical cost per culvert is about $75-100 including salary, fuel and transportation costs. Normally, two to four culverts will be steamed and opened in a typical day.

Culvert Steamer Specifications

Manufacturer:

Aeroil Products Co., Inc.
69-T Wesley Street
South Hackensack, NJ 07606
(210) 343-5200

Model:

98VP-LPG (Vapor) fired

Cost:

$1,135 (January 1993)

Fuel:

lpg

Fuel Consumption:

91 pounds per hour (approximately 180 kBTU)

Steam Rate:

90 pounds of water per hour at 15 psi

Tank Capacity:

25 gallons

Tank Rating:

125 psi

Optional Factory Supplied Equipment Required (cost $260)

- Two five-foot sections of half-inch pipe with a steam nozzle
- One ten-foot section of half inch steam hose
- Liquid petroleum gas torch with hose and gage

The SNF has added the following equipment to the steamer unit (cost $500)

- 100-feet of gas delivery hose (350 psi rating)
- Five eight-foot sections of half-inch pipe
- Six quick disconnect fittings
- Two pipe wrenches
- Two adjustable wrenches
- Striker and snap ring pliers

Other optional equipment the SNF has included with the unit to make the task more efficient (cost $890)

- Heavy duty utility trailer
- One 25 psi pressure relief valve
- One steam rated half-inch shutoff valve
- Two 30 gallong lpg tanks

Insulated, waterproof gloves should always be worn for protection against cuts and burns. Safety glasses and hearing protection is recommended. Care should always be taken when working around this equipment because of flames, heat/steam, and pressure.

For more information, call the USDA Forest Service at (909) 599-1267 or the Superior National Forest at (218) 365-7631.

Taken from the United States Department of Agriculture Forest Service Technology & Development Program's "Road Tech Tips," October 1993.

Plans for Culvert Pipe End Reshaper Available

By Douglas Wright

A common problem in rural road maintenance is what to do about the ends of corrugated metal culvert pipes that have been crushed. Something has to be done, otherwise water backs up in the pipe and the ditch upstream and eventually all sorts of nasty things happen to the road.

Typically, people have tried to fix crushed pipes by using a jack of some type to reshape the ends. If you have ever tried to do this, you know how ineffective it is.

Another solution is to replace the entire pipe. That works great but is very expensive because of the cost of pipe and labor. It is also inconvenient because of the need to close the road. This is a particularly disagreeable solution when the part of the load-carrying pipe under the road has nothing wrong with it.

Now there is a better solution.

For about $270 in materials, you can build a device to reshape your culverts that really works.

The device consists of a welded hydraulic cylinder with a scissor type jack attached to the actuating rod. When the jack is collapsed, it can be placed in the end of the crushed pipe. The cylinder is then retracted, the jack expands and the pipe end is reshaped. The entire process takes about as long as it takes to read this paragraph.

One of the goals in designing the device was to make use of common "off the shelf" components. There is nothing sophisticated about the parts or design at all. There is a minimum amount of machining and welding involved. This reshaper is designed so that it can be constructed by people working in a typical maintenance shop.

For further information on the reshaper or to receive a set of the plans, contact: Douglas Wright, 308 CITD, Stillwater, Oklahoma, 74078 or call (405) 744-6049.

Taken from the Oklahoma State University's Center for Local Government Technology's "Oklahoma Local Government News," Fall 1993.

Blading at Intersections

Blading the Intersection of Aggregate Surfaced and Paved Roads

Bumps form on one side of the road at paved intersections and dips form on the other (gravel) side due to continuous blading with the flow of traffic. Alternate blading against the flow of traffic will produce the best results.

- Gradually eliminate the crown, starting about 50 to 100 feet before the intersection. At the point where the two roads meet, the grade should be the same.
- Change the angle of the blade to meet the paved road, raise the blade, pull onto the pavement, drop the blade, put the grader in reverse, and pull the aggregate off the paved road.
- Check to see if an extra pass or two is needed to eliminate the crown and to ensure that the shoulders have slope.
- With the grader facing against the flow of traffic, cut the bump, starting at the edge of the paved road, moving material to the other side of the road. Turn the grader around and spread excess material into the dip.

Blading the Intersection of Two Aggregate Surfaced Roads

- Gradually eliminate the crown on each road, starting about 50 to 100 feet before the intersection.
- Check to see if an extra blading pass is needed to eliminate the crown and ensure that the shoulders have slope.

From Michigan Technological University's "The Bridge," Vol. 7, No. 3, spring 1993.

15 Trends and Facts Highway Agencies Should Know About Tort Liability

By Daniel S. Turner, Professor and Head of Civil Engineering at the University of Alabama

This presentation summarizes the tort liability situation for state highway agencies across the nation. It was prepared using questionnaire data from the Administrative Subcommittee on Legal Affairs of the American Association of State Highway and Transportation Officials. The AASHTO data was supplemented by more than 150 telephone calls by the author. Data from 200 years of tort losses were used to prepare the paper.

The threat of possible lawsuits has become an accepted part of public highway agency business. This is because the number of tort claims, the number of suits, and the consequent financial losses have grown rapidly in response to this growth in liability. Seven nationwide surveys were conducted by AASHTO between 1978 and 1992. These surveys provide an overview of the trends and current magnitude of the tort situation. Among the most interesting conclusions that can be drawn are the following:

1. The number of tort claims against state highway agencies grew since 1972 at a compound interest rate of almost 15 percent.

2. The number of claims continues to grow; it has not reached a peak or plateau.

3. The number of claims against state highway agencies during 1991 may be conservatively estimated to fall between 31,000 and 32,000.

4. A partial response to the AASHTO surveys indicated state DOTs had accumulated at least 248,000 claims since 1972. A conservative estimate of the full amount is that at least 330,000 claims were received in that period.

5. At the beginning of 1992, two states (New York and California) had multibillions of dollars in tort claims pending in their court systems. At least 10 other states each had more than $10 million pending.

6. At the beginning of 1992, there were 29,000 to 34,400 highway tort suits pending against state highway agencies.

7. The face value of pending suits was between $18.0 billion and $18.8 billion at the beginning of 1992. This was above the FHWA obligation ceiling (15.3 billion) for the same year.

8. If all states had responded to the AASHTO survey, it is estimated that $145 to $345 million would have been needed by state highway agencies for settlement and judgements in 1991.

9. State highway agencies probably spent over $60 to $75 million defending liability claims and suits in 1991.

10. A conservative estimate is that state and local governmental agencies in the United States spent at least $400 to $850 million in 1991 defending and disposing of claims and suits. The author feels strongly that this is a conservative, minimum value and that the true value might be quite a bit larger.

11. A partial response of the states indicated cumulative tort losses of $800 million since 1972. If all states had reported, the total state-level tort losses may be conservatively estimated at $1.3 to $1.9 billion from 1972 through 1991.

12. The types of tort claims vary widely. Of the 10 states that reported data on their top five claims, only the topics of "maintenance" and "design" showed up with any consistency from state to state.

13. Nine states attempted tort legislation in recent years. The most popular topics were joint and several liability, collateral payments, design immunity, and economic defense.

14. Over 80 percent of the state DOTs are self-insured against tort suit losses, and 13 percent carry commercial catastrophic coverage, whether self-insured or not.

15. The 29 state DOTs that responded to the 1992 YACHT survey reported that they had 1344 attorneys, or about 35 per state. Of these, 46 percent were DOT employees, 20 percent were Attorney General employees, 19 percent worked for another government agency, and the remainder were private attorneys hired under contract.

In summary, tort liability is continuing to grow as a problem area for highway agencies. There is no magic cure; these agencies must expect that suits will continue and must develop risk management programs to limit their areas of liability. In addition, highway employees must learn to work within the legal system and to vigorously defend these lawsuits. Proper training is a major component of risk management, and America's LTAP programs can play a lay role by providing training.

Presentation at National T2 Conference at the University of Puerto Rico-Mayaguez, August 1993, taken from the Nebraska Technology Transfer Center's "Interchange," Vol. 7, No. 4, summer 1993.

Pavement Edge Drops Can Cause Accidents

A difference of more than three inches between pavement and shoulder can contribute to severe traffic accidents, especially when the driver is inexperienced or impaired. Bad weather makes the hazard worse.

The Kentucky Transportation Center's engineers testify that a drop of more than three inches is defective, that shoulders have to be repaired immediately and, if they can't be, there has to be signing and barricades at proper intervals. They recommend barrels or barricades with lights every 200 feet or less.

In the classic situation, a motorist goes off onto the shoulder and tries to steer back onto the road without slowing down. The edge keeps the car from getting back onto the pavement so the driver turns more sharply. The car suddenly mounts the pavement and shoots across into the oncoming traffic or turns sideways and rolls.

When a difference of more than three inches is determined, appropriate measures should be taken to prevent any accidents until the shoulder can be repaired.

Edge drops can occur when an overlay is applied to the road surface, but shoulder work is delayed. Improper shoulder maintenance also can create edge drops.

The best solution to edge drop in construction zones is to carefully coordinate surface and shoulder maintenance projects. Pull shoulders up to eliminate the problem as soon as possible.

When an edge drop has to be left overnight, a temporary gravel wedge or filler can be used to ensure driver safety. Periodically checking all roadways and proper shoulder maintenance should help eliminate pavement drops on existing highways.

Taken from The Kentucky Transportation Center's "The Link," Vol. 9, No. 2, Summer 1993.

When hard hats and hard heads clash

The slightest damage to any part of the brain can severely affect some other area of the body, either temporarily or permanently. The skull protects the brain, a hard hat protects the skull, and if treated and worn properly, a hard hat can save your life.

Hard hats can cushion a blow to the head, protect against electric shock, chemical spills or hot materials. But often there are complaints about wearing hard hats. Comments include: 'It's too hot in the summer;' 'It's too cold in the winter;' and 'It's too heavy.'

Tests prove, however, that in hot weather the temperature inside a hard hat is 12 degrees cooler than a baseball cap. The head is kept cooler because ventilation is provided by air spaces between the shell and the suspension. The hard hat's surface also reflects heat rather than absorbing it. And for cold weather, liners are available. (Never wear a hard hat over ordinary caps or hats in the winter.)

As for the weight of a hard hat, the average hard hat weighs 13 ounces. The average head weighs 13 pounds. And, at one ounce of protection per pound of head, hard hats are a bargain worth taking advantage of.

But finally, a person may not need a hard hat if:

- they have x-rays proving that they have a four-inch skull and equally thick protection around the other sensitive head and neck areas of their body,
- their doctor just told them that they have six months to live, and forgot to mention it five months ago,
- they play Russian roulette for recreation every weekend, or
- they enjoy stopping large, heavy rocks pitched by graders and loaders with their head.

Originally prepared by the Washington Department of Transportation. Edited for Alaska T2 Program from "AZ Tech Transfer," Volume 9, Number 1, April 1993, taken from ITRE Transportation "TRACKS," Volume 7, Issue 3.

Disturbing Facts of Life (and Death) Behind the Orange Line

Fact...

Four out of five drivers say they slow down when they see a construction zone warning sign and construction workers.

Fact...

When checked by radar, none of the above drivers actually slowed down, even those who said they did.

Fact...

At 60 m.p.h., a vehicle travels 176 feet in just two seconds.

Fact...

An orange-striped wooden barricade or a string of orange cones or barrels won't stop a 3,000 pound car hurtling at you at 88 feet per second.

Fact...

A recent study found that facts like these make workers very concerned about their safety, with good reason.

Another Cure for Damaged Hoisting Chains

The Winter 1992 issue of *The Bridge* described an innovative Chain Guard Protector designed by the crew of District 5, Vermont Agency of Transportation.

Bob Hiatt, Public Works Director in Mt. Serling, Kentucky, has come up with another innovative idea to protect chains from being damaged when used on loader buckets.

Scrap Materials Give Good Protection

His idea involves inexpensive materials that are probably already in your shop, and the design is easy to implement.

The following steps describe how to build a guard that will cover the length of the bucket edge:

1. Use a piece of heavy wall conduit made of steel. The wall of the pipe should be one-quarter inch thick with a three-inch inside diameter. Cut the pipe to the length of the cutting edge, or lip of the loader bucket.

2. Cut the section lengthwise from one end to the other and the same width as the thickness of the bucket, so it will easily slide over it.

3. Drill holes in the cutting edge of the bucket and matching three-quarter inch holes in the pipe, one to one and one-quarter inches from the outside edge of the pipe so there will be plenty of metal for good support.

4. Insert pull pins into the pipe and through the holes in the bucket edge to secure the pipe on the bucket.

Hoe Ram Storage

Hiatt also came up with an interesting and efficient way to store the hoe ram when not in use.

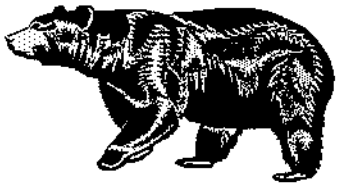
He set a 12-inch long piece of pipe in a three-foot square slab of concrete. The backhoe operator just has to drop the bit of the hoe ram into the pipe and unfasten it from the backhoe – turning an awkward task into a one-person operation.

In addition, storing the ram in this position makes the ram easier to attach to the backhoe the next time it is needed.

For more details on either of these ideas, contact the Michigan LTAP Program at (906) 487-2102.

Stationary Grizzly Solves Sander Problem

The Clare County Road Commission has solved a nagging sander problem in an elegant way. This stationary "grizzly" sifts out the frozen clumps of sand when filling their sanders and eliminates the need for truck-mounted grizzlies.



But this structure accomplishes more than just sifting sand. According to Steve Stocking, Engineer-Manager, "This structure not only keeps the sand clumps out of the sanders, but more importantly it also eliminates the need for drivers to climb around on the sander in dangerous, icy conditions, trying to knock sand clumps off of the truck-mounted grizzly."

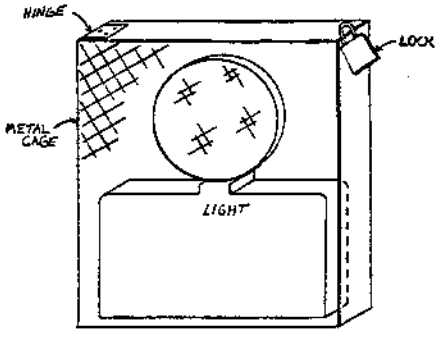
For more information about this stationary grizzly, contact the Michigan LTAP office at (906) 487-2102.

From Michigan Technological University's "The Bridge," Vol. 8, No. 1, fall 1993.

Put Your Light in a Cage

George Kross, Project Manager of the Saginaw County Road Commission, says his county saves (by conservative estimate) $1,900 per year by putting barricade lights in locked cages.

In 1985, the Commission's maintenance division estimated that at least 100 of its lights (with batteries), each costing $19, were damaged or stolen every year. The cages have proved so successful in preventing vandalism that many local contractors now use them.



Each cage required about $2 for materials and $8 for labor, and as Kross suggests, could be mass-produced at lower cost. The cages can be used year after year.

Each cage is bolted from the inside to prevent removal from the barricade. The cage simplifies battery replacement; it's easy to drop a new light into the cage and change the old light's batteries back in the shop.

"By keeping warning lights operating," says Kross, "the cages may save lives."

From Michigan Technological University's "The Bridge," Vol. 5, No. 2, winter 1991.

Way to go, men!

The following story comes from Alberta's T2 Center's newsletter, **Transearch**. *Alaskans have the same ingenuity, so tell us about it by boasting to us and we'll write you up.*

The authors of the article, Michael J. Potter and Keith C. Russell, had the job of replacing cut-off guide posts when the ground, was frozen. They took a propane torch to warm the ground but had a better idea.

"Instead, we found that passing the burning torch across the broken-off bottom mushroomed it out. By cutting the top section off completely, we were then able to re-insert it 4 inches to 6 inches into the mushroom portion."

To make the fit easier, they heated the portion to be inserted and rolled it on the frozen ground to get a taper. After insertion, they used snow and gloved hands to mold the joint into a smooth finish. They saved the post. No maintenance was needed till spring.

If you would like to submit an idea that you discovered, please call or write the T2 Program at 2301 Peger Road, Fairbanks, AK 99709-5399, 907/ 451-5320. We would love to hear from you.

Recycled Tires Cut Repair Costs Around Manhole Covers

During a brainstorming session between the Ontario Ministry of

Transportation's Survey and Design Office and Domial Environtech Inc. of Mississauga, a member of the team recalled seeing a machine that cut perfectly round holes from asphalt pavement. The smooth cut was considered an excellent joint for manhole repairs. But rather than fill it with asphalt, someone suggested using old tires. The result: a rubber transition collar for manholes.

Manhole Maintenance

Each year about 250,000 manholes are repaired in Ontario. These repairs are needed because seasonal movement of the manhole breaks the surrounding asphalt. Current methods of asphalt patching around manholes have a short life span-between one and three years.

As with any new product, the rubber transition collar has to be tested. Because this involved tire disposal, the Ministry of the Environment agreed to join in the funding for 100 trial collars.

The City of Etobicoke agreed to give the new collars a try. "Since road mangers must be inventive and use innovative ideas to reduce cost," said Tom Ellerbusch, director of the city's Road and Structures Engineering Department, "we happily put the first trail collars in our municipality."

The collars were developed by Domal Environtech Inc., in conjunction with Soren Pedersen, MTO's

Design Development Analyst, and MOE.

How a Tire Fits a Manhole

The transition collar is 47 inches in outside diameter and fits over a standard manhole frame. A sealant is used between the asphalt and collar to keep moisture out of the road base. each collar is made form 26 tires and weighs approximately 275 pounds. The tires are ground to minus eight mesh and the fiber is left in for strength, but the metal is removed. The specification for the rubber is the same as for rubber railway crossings. The rubber collars allow expansion and contraction around the manhole, prevent moisture infiltration, and have a life expectancy around 15 years.

Also being produced are rubber adjustment rings to go under the manhole frame. These rings offer flexibility and absorb impact loading. They are now specified for use on all manholes in the City of Etobicoke. A two-inch ring is made from 10 tires and a three-inch ring from 15 tires.

Costs vs the Life of Repair

The present cost of repairs with the rubber collar is approximately $1,000 including frame, versus about $300 for conventional asphalt. But the extended service life of the repair more than offsets the additional cost. Domal Environtech will be opening their own manufacturing plant, which may lower costs further.

The company is now working on collars for catch-basins and water valves, which are two areas in a roadway that create major maintenance problems. The potential market for this Ontario idea is worldwide. Not only will it improve road repairs, but it will also consume a considerable number of used tires.

From "Municipal Routes," February 1993, Ontario Good Roads Association.

1994 T2 CALENDAR OF EVENTS

DATE	EVENT	SPONSOR/CONTACT	LOCATION
May 3-5	*NHI #14231 Practical Conflict Management Skills to Resolve Highway/Wetlands Issues	DOT&PF, 907/ 451-5320	Anchorage, Alaska
May 10-12	*NHI #14231 Practical Conflict Management Skills to Resolve Highway/Wetlands Issues	DOT&PF, 907/ 451-5320	Fairbanks, Alaska
May 15-21	3rd Internat'l Road Federation Exec. Conference on Motor Vehicles and the Environment	Internat'l Road Federation, FAX: 202/ 479-0828	Orlando, Florida
May 18	Asphalt Research Products: Asphalt Binder & SUPERPAVE	Alaska T2 Program, 907/ 451-5320	Wickersham Banquet Hall, Fairbanks, Alaska
May 19	Asphalt Research Products: Asphalt Binder & SUPERPAVE	Alaska T2 Program, 907/ 451-5320	Regal Alaskan, Anchorage, Alaska
May 23	Asphalt Research Products: Asphalt Binder & SUPERPAVE	Alaska T2 Program, 907/ 451-5320	Westmark Baranoff, Juneau, Alaska
May 23-27	Reinventing Transit: Accessing America's Communities	Community Transit EXPO '94, CTAA, 800/ 527-8279	Pittsburgh, Pennsylvania
Jul 3-7	International Road Federation Conference & Exposition	IRF and the Transportation Association of Canada, 613/736-1350	Calgary, Alberta, Canada
Jul 31-Aug 3	LTAP National Conference	Arizona T2 Center, 602/965-2744	Arizona State University, Tempe, Arizona

*NHI - National Highway Institute

Meetings Around Alaska

Society	Chapter	Meeting Days	Location
ASCE	Anchorage Fairbanks Juneau	Monthly, 3rd Tues., noon Monthly, 3rd Fri., noon Monthly, 1st Wed., noon*	Northern Lights Inn Captain Bartlett Inn Breakwater Inn *except June - August
ASPE	Fairbanks	Monthly, 1st Fri., noon	Captain Bartlett Inn
ASPLS	Anchorage Fairbanks	Monthly, 3rd Tues., noon Monthly, 4th Tues., noon	Executive Cafeteria Federal Building Sunset Inn
ITE	Anchorage	Monthly, 3rd Thurs., noon	Sourdough Mining Company
IRWA	Sourdough Ch. 49 Arctic Trails Ch. 71 Totem Ch. 59	Monthly, 3rd Thurs., noon** Monthly, 2nd Thurs., noon# Monthly, 1st Wed., noon	West Coast Internat'l Inn **except July & Dec. Captain Bartlett Inn #except December Mike's Place, Douglas
APWA	Christmas Party	December 3rd, 6:00	Oriental Gardens, Anchorage
ICBO	Northern Chapter	Monthly, 1st Wed., noon	Zach's, Sophie Station
AWRA	Northern Region	Monthly, 3rd Wed., noon Brown Bag Lunch	Rm 531 Duckering Bldg., University of Alaska Fairbanks, Larry Hinzman, 474-7331

To publicize an event in our calendar, contact us at (907) 451-5320.

Who's Who in Alaska's Transportation

Spotlight on Bill Ellis, Street Superintendent
Juneau City and Borough Public Works, Alaska

Accustomed to temperate climates, Bill Ellis admits he's not any "crazier" about Juneau's weather now than when he arrived 13 years ago. However, the Street Superintendent for Juneau City and Borough Public Works said he's willing to tolerate the climate to satisfy his professional commitment of keeping Juneau's busy streets maintained.

To aid in his efforts, Ellis is currently developing a new maintenance management system. The system will require a lot of hard work and dedication to make it successful, but Ellis is no stranger to these qualities.

Ellis grew up on a ranch in Steamboat Springs, Colorado, where hard work was a fact of life. His father's dedication to two careers and their small spread left a lasting impression.

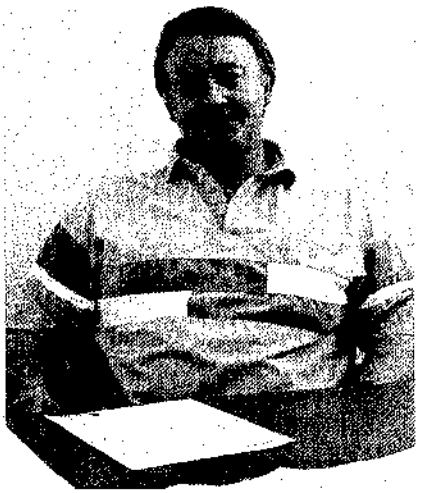
"He instilled in me, by example, an incredible work ethic that is still a big part of my life today," Ellis said of his dad, a full-time master equipment operator and part-time police officer. Inspired by his dad's hard-working nature, Ellis followed in his footsteps.

At age eight, with his dad as mentor, Ellis began operating heavy equipment such as bulldozers, motor graders and blades. At age 13, he said he was making "a modest amount of money" doing odd jobs with heavy equipment; for example, he dug irrigation ditches for neighbors and friends.

After spending three years in Vietnam, Ellis served for one year as a police officer in Steamboat Springs, Colorado, in 1970. His salary was $525 per month. With a wife and daughter to consider, Ellis decided to quit this low-paying job and re-enter the lucrative construction trade. From 1974 to late 1980, Ellis worked in the largest strip mine in Colorado.

In February 1981, Ellis moved to Juneau at the urging of a younger sister living there. He took a job as an equipment operator with the Juneau City and Borough. But, being unprepared for Juneau's weather at that time, Ellis returned to Colorado.

In August 1983, he was drawn back to the Juneau City and Borough. Eventually he rose



through the ranks of the Street Department to become the Mendenhall Valley Street Superintendent in 1992.

According to Ellis, the most difficult task at this job is public relations.

"The hardest part of the job is educating the public to the simple fact that you can only perform a finite amount of work with a shrinking budget," Ellis explained. "Priorities must be established and observed."

Another challenge for Ellis is keeping up with the problems that Juneau's demanding climate causes for maintaining the capital's streets. Every year, expansion and contraction of the road base from frequent freeze and thaw cycles results in numerous cracks and potholes in the pavement. This constant need for repair puts a strain on budgets, personnel, equipment and materials.

Although the job can be frustrating at times, Ellis enjoys its challenges. Being part of a team responsible for bringing many badly needed street projects to life is very rewarding, he said.

Ellis added that he is "never quite satisfied" with what he's done and constantly tries to improve. Ellis is also very safety oriented. For his promotion of employee health and safety awareness, he received the City and Borough of Juneau Outstanding Health and Safety Award in 1993.

When he's not trying to solve Juneau's street maintenance and safety problems, Ellis enjoys skiing, hunting and fishing.

"Catching a 200 pound halibut has been the highlight of my Alaska fishing to date," Ellis said.

Although Juneau is great for these types of activities, the location does not provide any opportunity for Ellis to participate in one of his favorite pastimes: steer roping.

"I'm still a dedicated country boy at heart and really do miss working daily with horses and cattle," Ellis said.